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A new direct demand model of long-term forecasting air passengers and air transport movements at German airports

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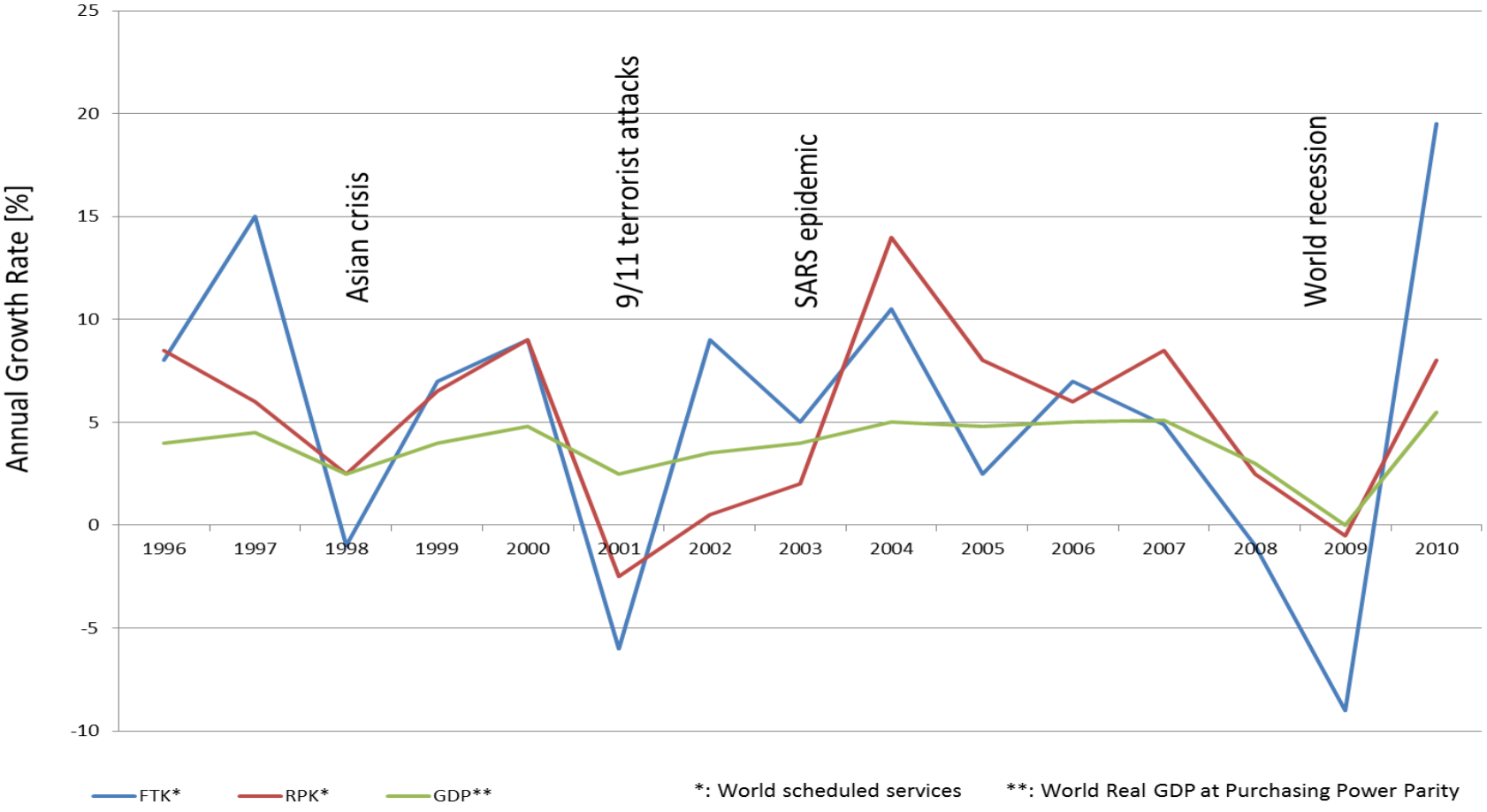
Agenda

- Classical Four-Step Model of DLR Passenger Demand & Flights Forecast of Germany
- New Direct Demand and Flight Model
- Conclusions

The Development of Global Gross Domestic Product (GDP) and Air Traffic (Passengers and Freight)



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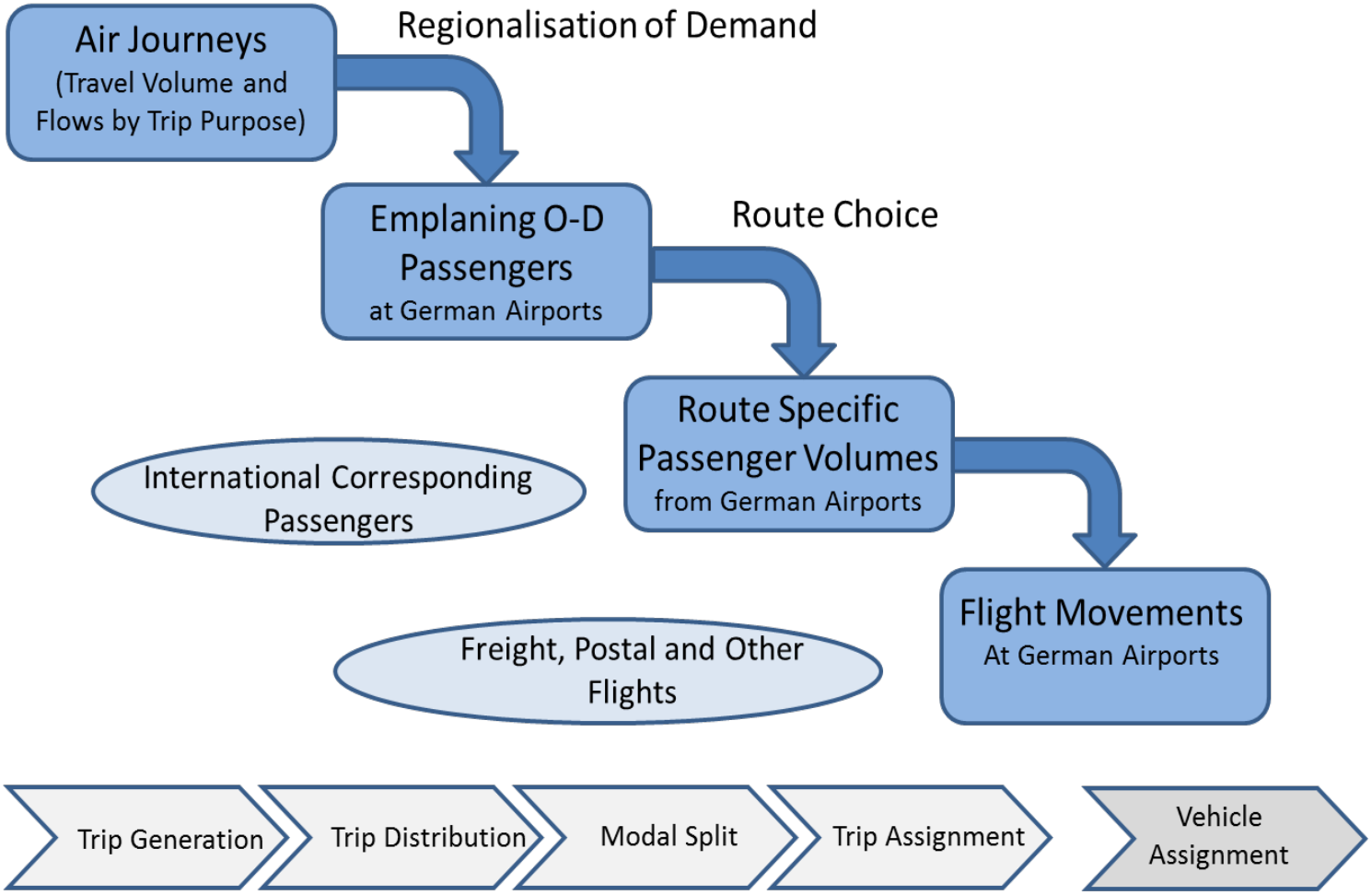
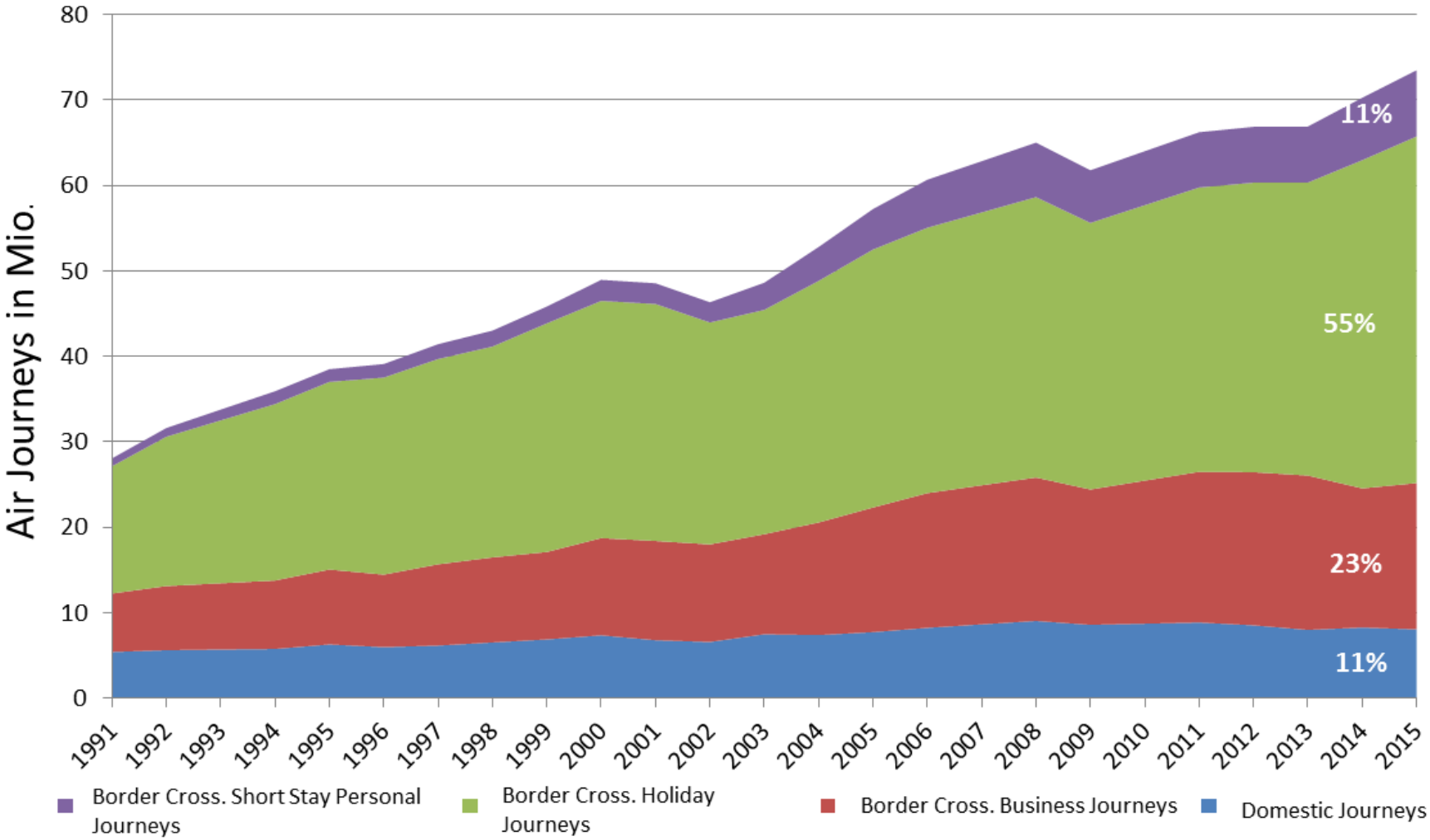
Classical Four-Step Model of DLR Passenger Demand & Flights Forecast of Germany



Development of Air Passenger Demand of Germany 1991 to 2015 by Trip Purpose



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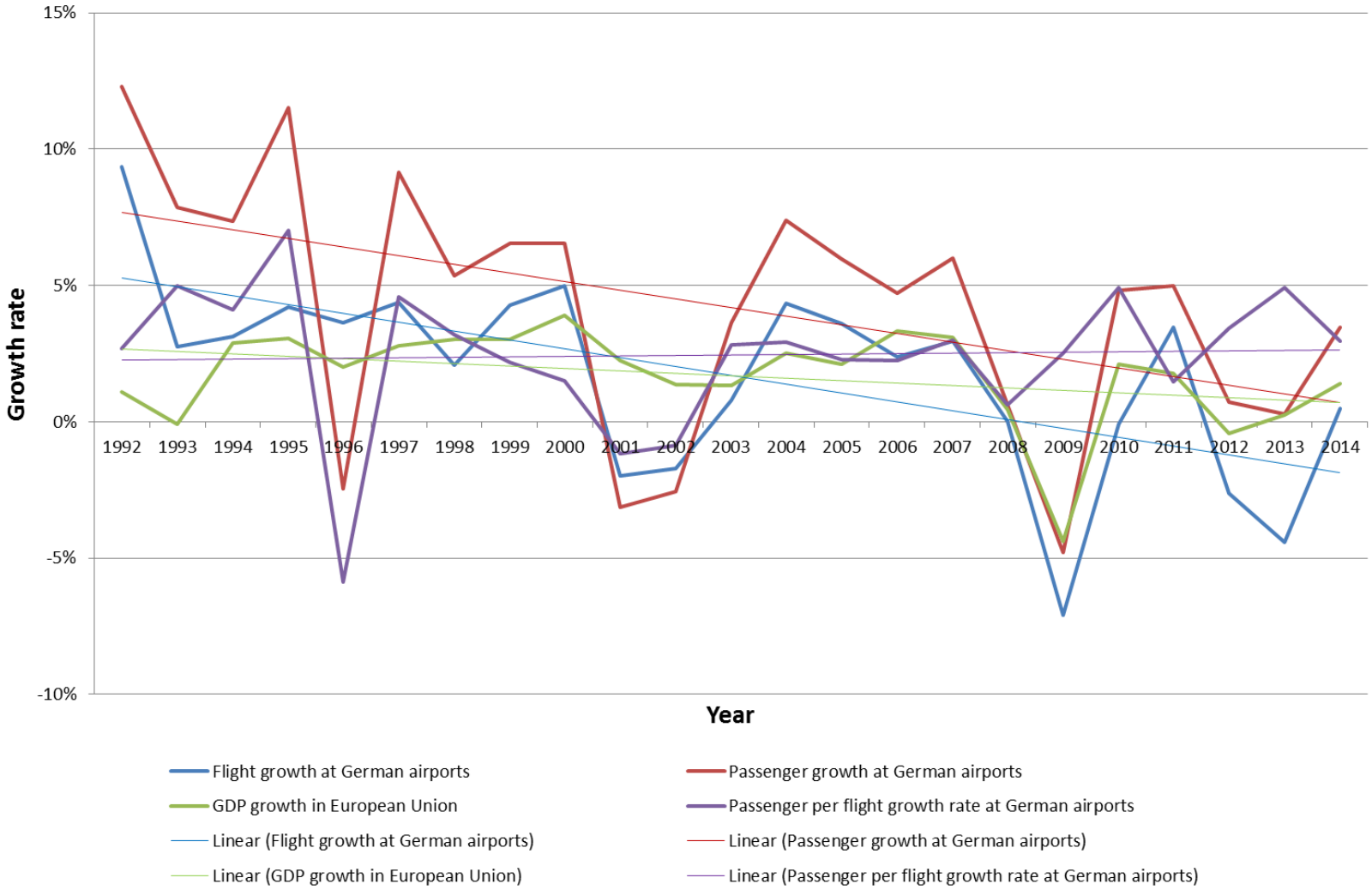
Segment Specific Model Approaches of Forecasting Air Passenger Demand of Germany

	Air Transport Demand Segments of Germany					
	Domestic Air Journeys	Border Crossing Air Journeys				
		Business Journeys		Private Purpose Journeys		
		Originating Travel	Attracted Travel	Originating Holiday Travel	Attracted Holiday Travel	Private Short Stay Travel
Forecast Model Approach	Dominated by business travel demand: Trip generation dependant on macro-economic productivity (GDP per employede person)	Branches of producing industry: Trip generation dependant on export rates; service sector: branch specific trend extra-polations	Ratio of originating and attracted travel demand almost constant over time; branch specific extra-polation of this ratio	Forecast of total holiday trip generation and modal split analysis; age group specific trend extra-polation of trip intensity, fre-quency and de-stination choice	Trend extra-polation of observed developments	Trend extra-polation of observed developments; special consideration of low cost carrier travel
Influencing Variables	Economic development, employment	Foreign trade, employment		Population, age structure, private income		
General Forecast Hypotheses	Continuous development of society and economy in Germany and world wide; further liberalisation and globalistion of transport; no capacity restraints in the air transport system; no basic change in the consumption behaviour.					
Structure 2014	11	12	11	47	8	11

Air Traffic & Socio-Economic Data and Non-Stationarity: Cointegration Approach



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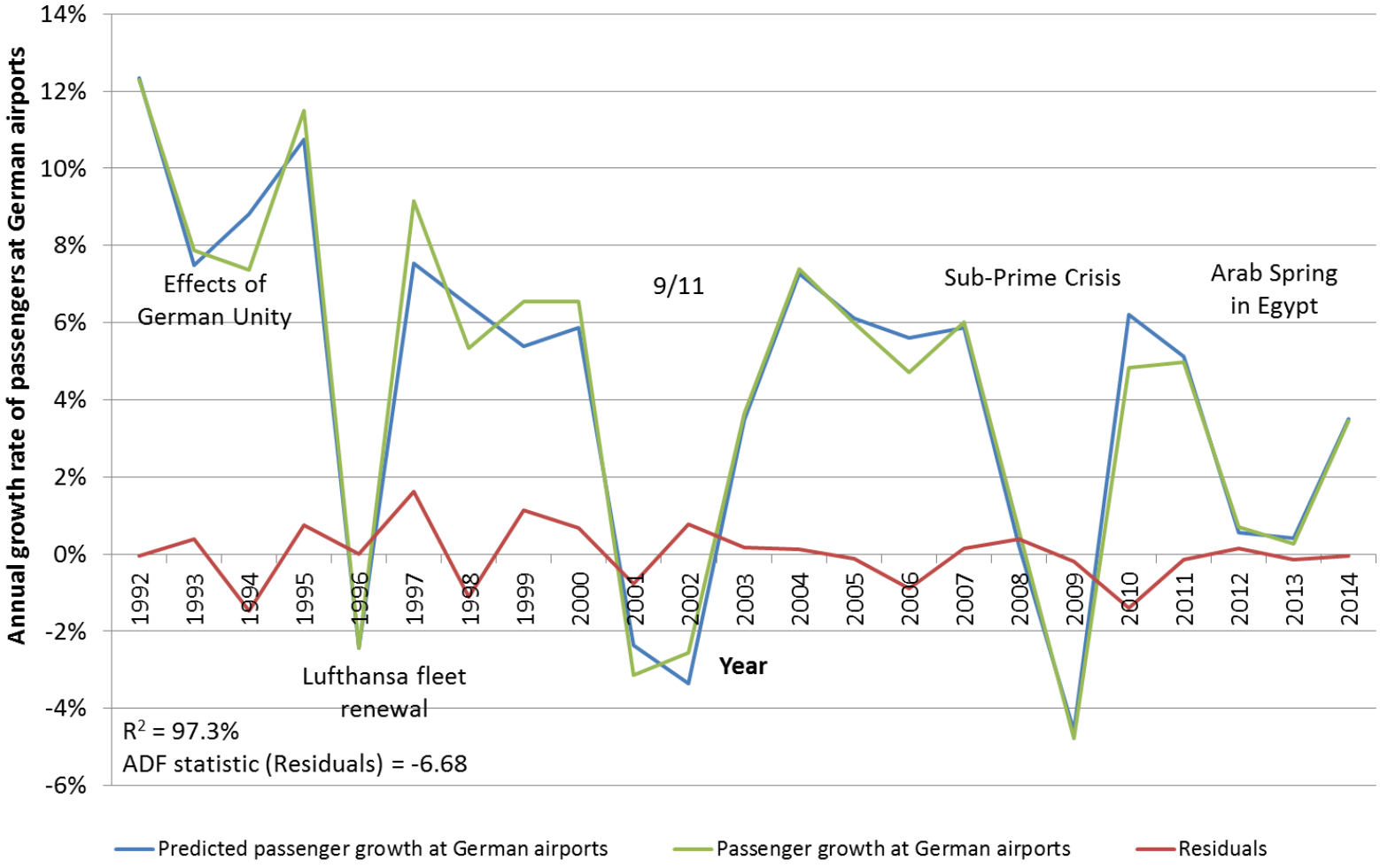
Objective of the direct demand model

- To model and predict future passengers at German airports
- In a way that the forecast is “as precise as possible”
- It is not the prime objective of this model to provide a model of individual air travellers’ behaviour
- Analyse the impact of past crisis on passenger demand at German airports

Actual Time Series and Ex-post Forecast of the Passenger Model



Estimation Results of the Passenger Model

	Coefficients	*Standard error*	*t Stat*	*p-value*
Intercept	-0.01029747	0.004065447	-2.53292334	0.022961765
GDP growth rate in European Union (in %)	1.33864893	0.119364016	11.2148449	1.08373E-08
Growth rate of passengers per flight (in %)	0.88189283	0.086731874	10.1680361	4.01135E-08
German Unity	0.38154884	0.037471924	10.182259	3.93795E-08
9/11 Attacks (2001 & 2002)	-0.0361058	0.007640279	-4.72571692	0.00027065
Post 9/11 & SARS (2004 & 2005)	0.02138957	0.007003294	3.05421484	0.008034097
Post Sub-Prime Crisis (2011 & 2012)	0.02369593	0.007791007	3.04144679	0.008246059
Arab Spring in Egypt (2012 & 2013)	-0.03286561	0.008291649	-3.96370023	0.001248201

- Blue: Primary explanatory variables
- Green: Secondary explanatory variables (“Shocks”)

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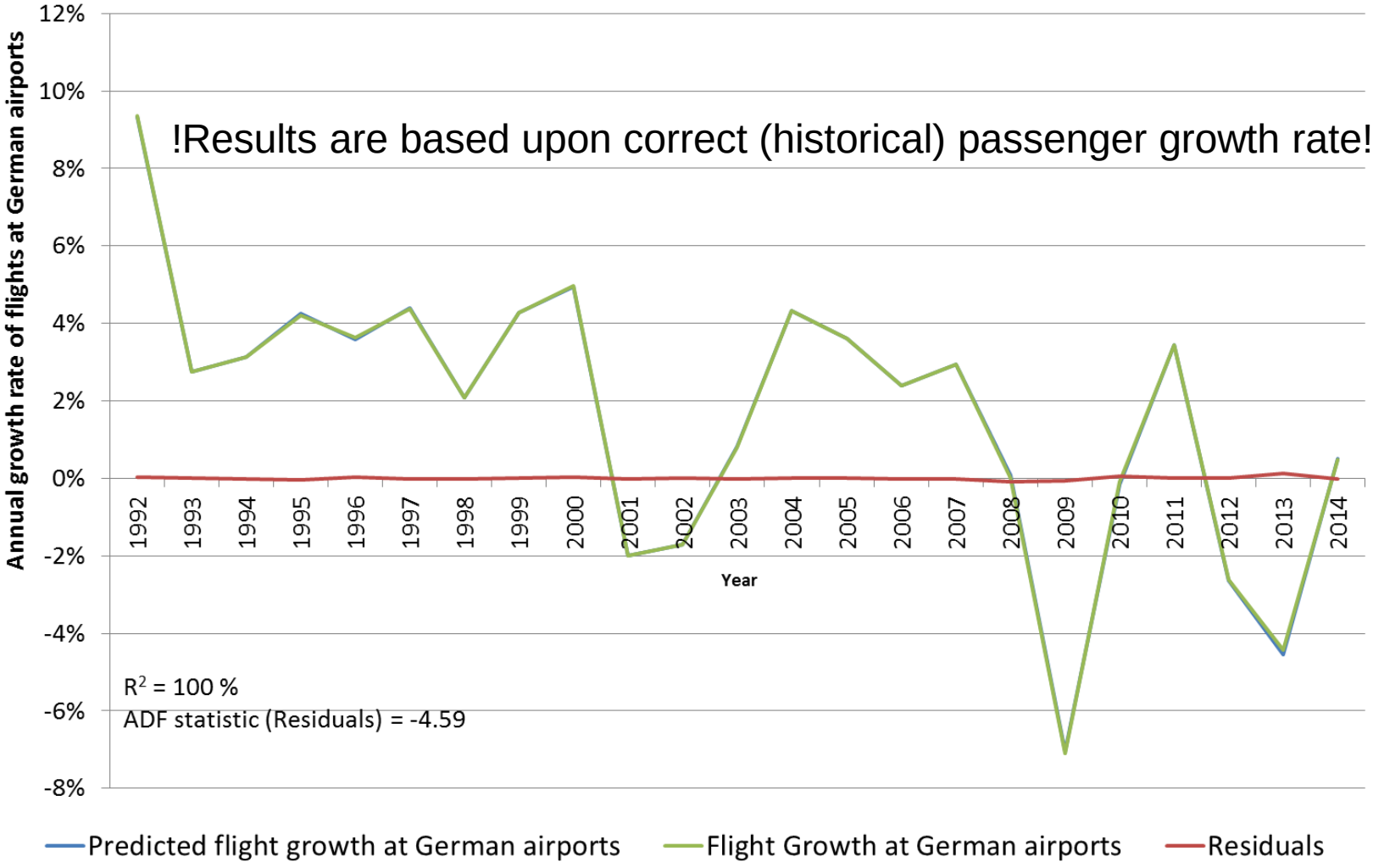
Actual Time Series and Ex-post Forecast of the Flight Model



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Estimation Results of the Flight Model

	Coefficients	*Standard error*	*t Stat*	*p-value*
Intercept	0.00101816	0.000158633	6.41832508	3.73633E-06
Passenger growth rate (in %)	0.96938002	0.002660059	364.420474	5.41996E-38
Growth rate of passengers per flight (in %)	-0.99995844	0.004546426	-219.943852	7.93493E-34
9/11 Attacks (2001 & 2002)	-0.00208076	0.000372562	-5.58498967	2.18981E-05

Flight volume growth rate = Passenger volume growth rate – Growth rate of passengers per flight

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Conclusions

- Both model approaches have their strength and weaknesses:
  - The classical approach emphasises cross-sectional issues, e.g. differences in travel behaviour
  - The direct demand and flight model emphasises longitudinal issues, e.g. cointegration & shocks
  - Further aspects: Data requirements, statistical significance of results, top-down vs. bottom-up, ...

- The new approach allows for an analysis and quantification of shocks, like e.g. 9/11, to the air transport system, which is a first step towards forecasting such shocks over the long-term

- Future research includes how to combine these two approaches effectively

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Thank you for your attention!

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